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21 March 1997

AGREEMENT

CONCERNING THE ADOPTION OF UNIFORM TECHNICAL PRESCRIPTIONS FOR WHEELED VEHICLES, EQUIPMENT AND PARTS WHICH CAN BE FITTED AND/OR BE USED ON WHEELED VEHICLES AND THE CONDITIONS FOR RECIPROCAL RECOGNITION OF APPROVALS GRANTED ON THE BASIS OF THESE PRESCRIPTIONS */

(Revision 2, including the amendments entered into force on 16 October 1995)

Addendum 82: Regulation No. 83

Revision 1 - Amendment 2

03 series of amendments - Date of entry into force: 7 December 1996

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES WITH REGARD TO THE EMISSION OF POLLUTANTS ACCORDING TO ENGINE FUEL REQUIREMENTS

UNITED NATIONS

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*/ Former title of the Agreement:

Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, done at Geneva on 20 March 1958.

GE.97-20810

Paragraph 4.4.1., footnote 1/, amend to read:

"1/ 1 for Germany, ... 23 for Greece, 24 (vacant), 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30-36 (vacant) and 37 for Turkey. Subsequent numbers shall be assigned ...."

Paragraph 5.3.1.4.2.1., amend the limits for M category vehicles as follows (footnote 5/ not being modified):

"

		Limit values	
Category of vehicle	Reference mass	Mass of carbon monoxide	Combined mass of hydrocarbons and nitrogen oxides
	Rm (kg)	L1 (g/km)	L2 (g/km)
M 5/	All	2.2	0.5

....."

Paragraph 5.3.1.4.3.1., amend the limits for M category vehicles as follows, including a new footnote "(*)" (foonote 5/ not being modified):

		Limit values		
Category of vehicle	Reference mass	Mass of carbon monoxide	Combined mass of hydrocarbons and nitrogen oxides	Mass of particulates
	Rm (kg)	L1 (g/km)	L2 (g/km)	L4 (g/km)
M 5/	All	1.0	0.7 (*)	0.08 (*)

....

(*) For vehicles fitted with compression ignition engines of the direct injection type, the value L2 is 0.9 g/km and the value L4 is 0.10 g/km up to 30 September 1999."

Paragraph 8, amend to read:

"8. CONFORMITY OF PRODUCTION

8.1. Every vehicle bearing an approval mark as prescribed under this Regulation shall conform, with regard to components affecting the emission of gaseous pollutants by the engine and evaporative emissions, to the vehicle type approved.

8.2. As a general rule, conformity of production with regard to limitation of emissions from the vehicle (test types I, II, III and IV) is checked on the basis of the description given in the communication form and its annexes.

8.2.1. Vehicles fuelled with leaded petrol (Approval A).

8.2.1.1. For verifying the conformity of the vehicles in type I test, the following procedure is adopted:

8.2.1.1.1. A vehicle is taken from the series and subjected to the test described in paragraph 5.3.1.

8.2.1.1.1.1. The limit values given in paragraph 5.3.1.4.1.1. are replaced by the following limit values :

Reference mass Rm (kg)	Mass of carbon monoxide L1 (g/test)	Combined mass of hydrocarbons and nitrogen oxides L2 (g/test)
Rm ≤ 1 020	70	23.8
1 020 < Rm ≤ 1 250	80	25.6
1 250 < Rm ≤ 1 470	91	27.5
1 470 < Rm ≤ 1 700	101	29.4
1 700 < Rm ≤ 1 930	112	31.3
1 930 < Rm ≤ 2 150	121	33.1
2 150 < Rm	132	35.0

8.2.1.1.1.2. The limits given in paragraph 5.3.1.4.1.2. are replaced by the limit values given in the table of paragraph 8.2.1.1.1.1. However, the values for the combined mass of hydrocarbon and nitrogen oxides are to be multiplied by a factor of 1.25.

8.2.1.1.2. If the vehicle taken from the series does not satisfy the requirements of paragraph 8.2.1.1.1. above, the manufacturer may ask for measurements to be performed on a sample of vehicles taken from the series and including the vehicles originally taken. The manufacturer shall determine the size n of the sample. Vehicles other than the vehicle originally taken shall be subjected to a single type I test. The result to be taken into consideration for the vehicle taken originally is the

arithmetical mean of the three type I tests carried out on the vehicle. The arithmetic mean $(\overline{x})$ of the results obtained with the sample and the standard deviation S 8/ shall be determined for the carbon monoxide emission and for the combined emissions of hydrocarbons and nitrogen oxides.

The production of the series shall then be deemed to conform if the following condition is met:

$$\overline{x} + k \cdot S \leq L$$

Where:

L : is the limit value laid down in paragraph 8.2.1.1.1. for the emissions of carbon monoxide (L1), the combined emissions of hydrocarbons and nitrogen oxides (L2)

k : is a statistical factor depending on n and given in the following table :

n	2	3	4	5	6	7	8	9	10
k	0,973	0,613	0,489	0,421	0,376	0,342	0,317	0,296	0,279
n	11	12	13	14	15	16	17	18	19
k	0,265	0,253	0,242	0,233	0,224	0,216	0,210	0,203	0,198

$$\text{if} \quad n \geq 20 \quad k = \frac{0,860}{\sqrt{n}}$$

8.2.1.2. If a type II or type III test is to be carried out on a vehicle taken from the series, the conditions laid down in paragraphs 5.3.2.2. and 5.3.3.2. above shall be complied with.

8/ $S^2 = \sum \frac{(x - \overline{x})^2}{n - 1}$, *where x is any one of the n individual results.*

8.2.1.3. Notwithstanding the provisions of annex 4, paragraph 3.1.1. to this Regulation, the technical service responsible for verifying the conformity of production may, with the consent of the manufacturer, carry out tests of types I, II and III on vehicles which have been driven less than 3,000 km.

8.2.2. Vehicles fuelled with unleaded petrol (Approval B) and vehicles fuelled with diesel fuel (Approval C).

Control of conformity of production is based on the study by the approval authority of manufacturer's adequate arrangements and documented control plans in order to ensure that vehicles, when in production, conform to the approved type, with regard to emissions of pollutants.

When the level of control appears unsatisfactory the approval authority may carry out any test or check on vehicles in production.

8.2.2.1. If a type I test is to be carried out and an approval of a vehicle type has had one or several extensions, the tests will be carried out on the vehicle(s) described in the first type approval application document.

After presentation to the authority, the manufacturer shall not undertake any adjustment to the vehicles selected.

8.2.2.1.1. Three vehicles are randomly taken from the series and are tested as described in paragraph 5.3.1. The deterioration factors are used in the same way. The limit values are given in paragraphs 5.3.1.4.2.1 (Approval B) or 5.3.1.4.3.1. (Approval C).

8.2.2.1.2. If the authority is satisfied with the production standard deviation given by the manufacturer, the tests are carried out according to annex 11, paragraph 1.

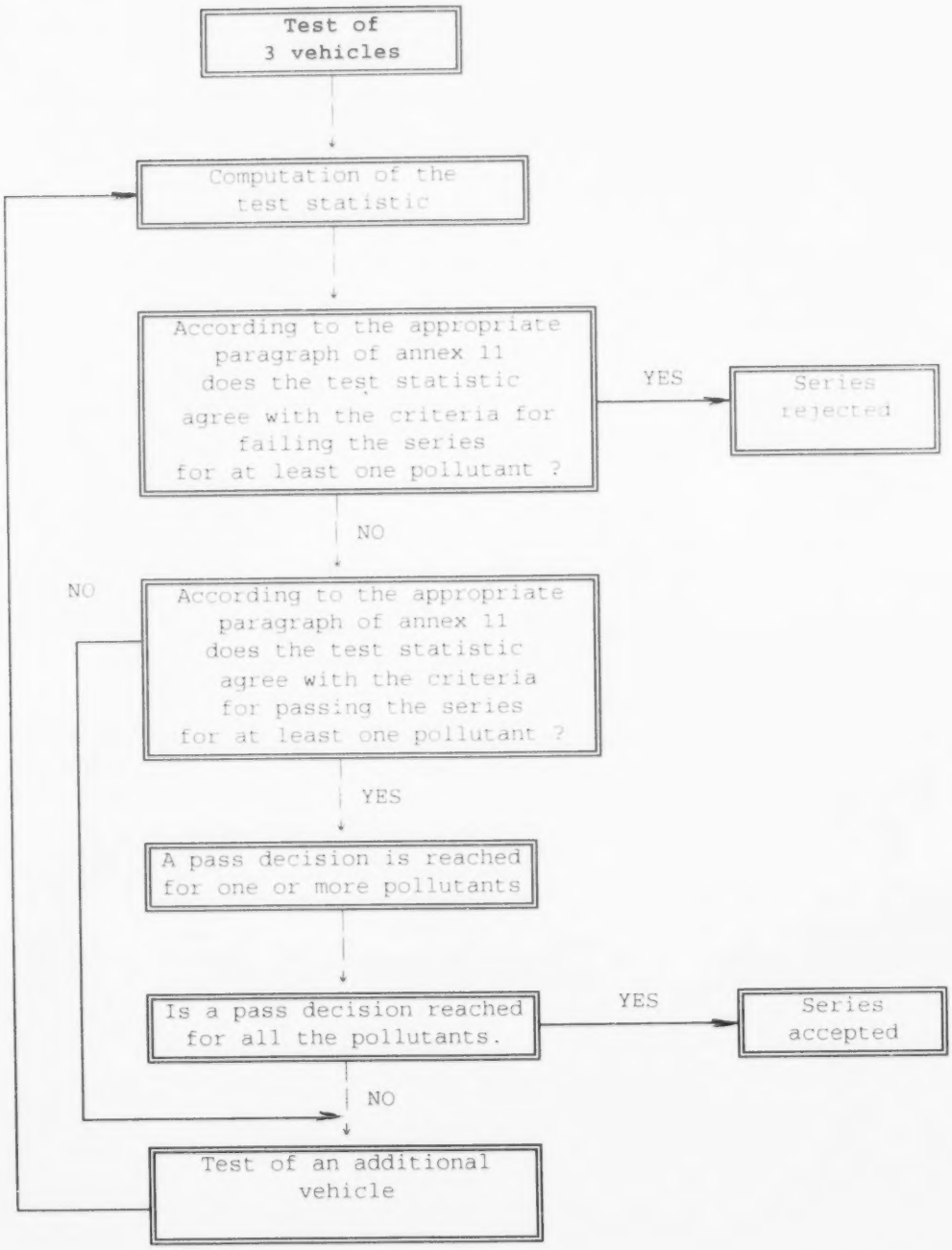
If the authority is not satisfied with the production standard deviation given by the manufacturer, the tests are carried out according to annex 11, paragraph 2.

8.2.2.1.3. The production of a series is regarded as conforming or nonconforming, on the basis of a test of the vehicles by sampling, once a pass decision is reached for all the pollutants or a fail decision is reached for one pollutant, according to the test criteria applied in the appropriate paragraph of annex 11.

When a pass decision has been reached for one pollutant, this decision will not be changed by any additional tests made to reach a decision for the other pollutants.

If no pass decision is reached for all the pollutants and if no fail decision is reached for one pollutant, a test is carried out on another vehicle (see Figure 2).

Figure 2


Test of 3 vehicles
Computation of the test statistic
According to the appropriate paragraph of annex 11 does the test statistic agree with the criteria for failing the series for at least one pollutant ?
YES
Series rejected
NO
According to the appropriate paragraph of annex 11 does the test statistic agree with the criteria for passing the series for at least one pollutant ?
NO
YES
A pass decision is reached for one or more pollutants
Is a pass decision reached for all the pollutants.
YES
Series accepted
NO
Test of an additional vehicle

8.2.2.1.4. Notwithstanding the requirements of paragraph 3.1.1. of annex 4, the tests will be carried out on newly manufactured vehicles.

8.2.2.1.5. However, at the request of the manufacturer, the tests may be carried out on vehicles which have been run-in:

(i) a maximum of 3,000 km for vehicles equipped with a positive-ignition engine,

(ii) a maximum of 15,000 km for vehicles equipped with a compression-ignition engine.

In these cases, the running-in procedure will be conducted by the manufacturer who shall undertake not to make any adjustments to those vehicles.

8.2.2.1.6. When the manufacturer asks to conduct a running-in procedure ("X" km, where $X \leq 3{,}000$ km for vehicles equipped with a positive ignition engine and $X \leq 15{,}000$ km for vehicles equipped with a compression-ignition engine), the test may be carried out as follows:

(i) the pollutant emissions (type I) will be measured at zero and at "X" km on the first tested vehicle,

(ii) the evolution coefficient of the emissions between zero and "X" km will be calculated for each of the pollutant :

$$\frac{\text{Emissions "X" km}}{\text{Emissions zero km}}$$

It may be less than 1.

(iii) The subsequent test vehicles will not be subjected to the running-in procedure, but their zero km emissions will be modified by the evolution coefficient.

In this case, the values to be taken will be:

(a) the values at "X" km for the first vehicle,
(b) the values at zero km multiplied by the evolution coefficient for the other vehicles.

8.2.2.1.7. All these tests may be conducted with commercial fuel. However, at the manufacturer's request, the reference fuels described in annex 9 to this Regulation may be used.

8.2.2.2. If a type III test is to be carried out, it shall be conducted on all vehicles selected for the type I Conformity of Production test (paragraph 8.2.2.1.1.). The conditions laid down in paragraph 5.3.3.2. shall be complied with.

8.2.2.3. If a type IV test is to be carried out, it shall be conducted in accordance with paragraph 7 of annex 7."

Paragraph 9.1., amend the reference to "paragraph 8.3." to read "paragraph 8.2."

Annex 3, in the examples of the approval marks and in the captions below, amend the approval No. "022439" to read "032439" (6 times), and the words "02 series of amendments" amend to read "03 series of amendments." (three times)

Add a new annex 11, to read:

"Annex 11

PROCEDURE FOR VERIFYING THE CONFORMITY OF PRODUCTION REQUIREMENTS

1. If the production standard deviation given by the manufacturer is satisfactory.

1.1. This paragraph describes the procedure to be used to verify the conformity of production requirements for the type I test when the manufacturer's production standard deviation is satisfactory.

1.2. With a minimum sample size of 3 the sampling procedure is set so that the probability of a lot passing a test with 40 per cent of the proportion defective is 0.95 (producer's risk = 5 per cent) while the probability of a lot being accepted with 65 per cent of the proportion defective is 0.1 (consumer's risk = 10 per cent).

1.3. For each of the pollutants (CO, HC, NOx and particulates), the following procedure is used (see Figure 2 in the text of the Regulation).

Let
- L be the natural logarithm of the limit value for the pollutant,
- x_i the natural logarithm of the measurement for the i-th vehicle of the sample,
- s an estimate of the production standard-deviation (after taking the natural logarithm of the measurements),
- n is the current sample number.

1.4. Compute for the sample, the test statistic quantifying the sum of the standardized deviations to the limit and defined as:

$$\frac{1}{S} \sum_{i=1}^{n} (L - x_i)$$

I.5. Then:

(i) if the test statistic is greater than the pass decision number for the sample size given in Table 1, a pass decision is reached for the pollutant.

(ii) if the test statistic is less than the fail decision number for the sample size given in Table 1, a fail decision is reached for the pollutant.

(iii) otherwise, an additional vehicle is tested according to paragraph 8.2.2.1. and the procedure is applied to the sample with one unit more.

Table 1

Cumulation number of tested vehicles (current sample size)	Pass decision number	Fail decision number
3	3.327	- 4.724
4	3.261	- 4.790
5	3.195	-4.856
6	3.129	- 4.922
7	3.063	- 4.988
8	2.997	- 5.054
9	2.931	- 5.120
10	2.865	- 5.185
11	2.799	- 5.251
12	2.733	- 5.317
13	2.667	- 5.383
14	2.601	- 5.449
15	2.535	- 5.515
16	2.469	5.581
17	2.403	- 5.647
18	2.337	- 5.713
19	2.271	- 5.779
20	2.205	- 5.845
21	2.139	- 5.911
22	2.073	- 5.977
23	2.007	- 6.043
24	1.941	- 6.109
25	1.875	- 6.175
26	1.809	- 6.241
27	1.743	- 6.307
28	1.677	- 6.373
29	1.611	- 6.439
30	1.545	- 6.505
31	1.479	- 6.571
32	- 2.112	- 2.112

2. If the production standard deviation given by the manufacturer is not satisfactory or available.

2.1. This paragraph describes the procedure to be used to verify the conformity of production requirements for the type I test when the manufacturer's evidence of production standard deviation is either unsatisfactory or unavailable.

2.2. With a minimum sample size of 3 the sampling procedure is set so that the probability of a lot passing a test with 40 per cent of the proportion defective is 0.95 (producer's risk = 5 per cent) while the probability of a lot being accepted with 65 per cent of the proportion defective is 0.1 (consumer's risk = 10 per cent).

2.3. The measurements of the pollutants (CO, HC, NOx, and particulates) are considered to be log normally distributed and should first be transformed by taking their natural logarithms. Let m_o and m denote the minimum and maximum sample sizes respectively (m_o = 3 and m = 32) and let n denote the current sample number.

2.4. If the natural logarithm of the measurements in the series are $x_1, x_2, \ldots, x_j$ and L is the natural logarithm of the limit value for the pollutant, then, define :

$$d_j = x_j - L$$

$$\bar{d}_n = \frac{1}{n}\sum_{j=1}^{n} d_j$$

and

$$V_n^2 = \frac{1}{n}\sum_{j=1}^{n} (d_j - \bar{d}_n)^2$$

2.5. Table 2 shows values of the pass (A_n) and fail (B_n) decision numbers against current sample number. The test statistic is the ratio $\bar{d}_n/V_n$ and shall be used to determine whether the series has passed or failed as follows:

For $m_o \leq n \leq m$:

(i) Pass the series if $\bar{d}_n/V_n \leq A_n$.

(ii) Fail the series if $\bar{d}_n/V_n \geq B_n$.

(iii) Take another measurement if $A_n < \bar{d}_n/V_n < B_n$.

2.6. Remarks.

The following recursive formulae are useful for computing successive values of the test statistic:

$$\bar{d}_n = \left(1-\frac{1}{n}\right)\bar{d}_{n-1} + \frac{1}{n}d_n$$

$$V_n^2 = \left(1-\frac{1}{n}\right)V_{n-1}^2 + \left[\frac{\bar{d}_n - d_n}{n-1}\right]^2$$

(n = 2, 3, ... ; $\bar{d}_1 = d_1$; $V_1 = 0$)

Table 2

Minimum sample size = 3

Size of sample n	Pass decision number A_n	Fail decision number B_n
3	- 0.80385	16.64743
4	0.76339	7.68627
5	- 0.72982	4.67136
6	- 0.69962	3.25573
7	- 0.67129	2.45431
8	- 0.64406	1.94369
9	- 0.61750	1.59105
10	- 0.59135	1.33295
11	- 0.56542	1.13566
12	- 0.53960	0.97970
13	- 0.51379	0.85307
14	- 0.48791	0.74801
15	- 0.46191	0.65928
16	- 0.43573	0.58321
17	- 0.40933	0.51718
18	- 0.38266	0.45922
19	- 0.35570	0.40788
20	- 0.32840	0.36203
21	- 0.30072	0.32078
22	- 0.27263	0.28343
23	- 0.24410	0.24943
24	- 0.21509	0.21831
25	- 0.18557	0.18970
26	- 0.15550	0.16328
27	- 0.12483	0.13880
28	- 0.09354	0.11603
29	- 0.06159	0.09480
30	- 0.02892	0.07493
31	+ 0.00449	0.05629
32	+ 0.03876	0.03876